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IS 5117 (1993): Commercial boiling burners for use with LPG
[MED 23: Domestic and Commercial Gas Burning Appliances]



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भारतीय मानक
एल पी जी के साथ प्रयुक्त वाणिज्यिक उबलन
बर्नर — विशिष्ट
(पहला पुनरीक्षण)
Indian Standard
COMERCIAL BOILING BURNERS FOR
USE WITH LPG — SPECIFICATION
(*First Revision*)

UDC 683 945 : 665 725

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September 1993

Price Group 3

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Domestic and Commercial Gas Burning Appliances Sectional Committee had been approved by the Heavy Mechanical Engineering Division Council

This Indian Standard was first published in 1969. Since then many suggestions were received for its improvement. This standard is being revised to incorporate the suggestions received from time to time.

In preparing this standard, assistance has been derived from the BS 4104 : 1967 'Specification for catering equipment burning liquefied petroleum gases' issued by the British Standards Institution.

This standard is one of a series of Indian Standards on various domestic and commercial gas burning appliances (pressure type) used with LPG. General requirements of these equipment are covered in IS 5116 : 1985 'General requirements for domestic and commercial equipment for use with LPG (*second revision*)' which is a necessary adjunct to this standard. Should, however, any deviation exists between the requirements given in IS 5116 : 1985 and those of this standard, provisions of the latter shall apply.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 1 NOVEMBER 1994
TO
IS 5117 : 1993 COMMERCIAL BOILING BURNERS
FOR USE WITH LPG — SPECIFICATION

(First Revision)

(Page 3, clause 9.1.1) – Add the following at the end

‘9.1.2 BIS Certification Marking

The burners may also be marked with Standard Mark

9.1.2.1 The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.’

(HMD 23)

Reprography Unit BIS New Delhi India

Indian Standard

COMMERCIAL BOILING BURNERS FOR USE WITH LPG — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard specifies requirements and tests for appliances having boiling burners for heating, removable pans, kettles and stockpots using LPG at 2.942 kN/m² (30 gf/cm²). The appliances include hot plates on ranges, boiling tables, stockpot stoves and separate boiling burners. It also includes griddle plates used for dry frying.

1.1.1 The boiling burners may be open, in which the burner is covered by a removable grid, or solid, in which the burner is covered by a solid plate usually with removable solid ring. Separate test requirements are given for open and solid types, although similar test methods are employed.

2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard:

IS No	Title
4246 : 1992	Domestic gas stoves for use with liquefied petroleum gases — Specification (fourth revision)
5116 : 1985	General requirements for domestic and commercial equipment for use with LPG (second revision)
6480 : 1988	Glossary of terms relating to domestic and commercial gas-burning appliances

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 6480 : 1988 shall apply.

4 GENERAL

The relevant requirements given in 3 of IS 5116 : 1985 shall apply.

5 MATERIAL

The relevant requirements of material as specified in 4 of IS 5116 : 1985 shall apply.

6 CONSTRUCTION

6.1 The relevant requirements of Section 1 of IS 5116 : 1985 shall apply.

6.2 The jets shall have the following threads (see 8 of IS 5116 : 1985):

- Up to 160 l/h — 1 BA or M5
- Above 160 l/h — M9

7 PERFORMANCE

7.1 In addition to the relevant performance requirements specified in Section 2 of IS 5116 : 1985, the requirements specified in 7.2 to 7.4 shall also apply.

7.2 Requirement for Open Top Burners (Hot Plates on Ranges, Boiling Tables Boiling Burners, Stockpot Stoves)

7.2.1 Formation of Soot

A suitable test vessel selected from those given in Table 1, containing water, shall be placed on the burner and the burner lighted at FULL-ON position of the tap for 1 hour. After the test no soot shall be deposited on the burner and on the bottom of the vessel. This applies for all pressures from 2.452 to 3.432 kN/m² (25 to 35 gf/cm²).

7.2.2 The flames of each individual burner shall be stable. They shall cross light from all ports when jets at full gas rate with a pan in position and also without a pan in position.

7.2.3 Combustion requirements shall comply with 21 of IS 5116 : 1985. The sampling hood as shown in Fig 1 shall be used. An aluminium test vessel of suitable dimensions, selected according to the burner ratings given in Table 1, with weight of water given against it in Table 1, shall be placed over the burner under test and the test carried out as specified in Annex A.

7.2.4 Thermal Efficiency Test

Each burner shall be tested individually when operating at its full rate and loaded with water in an aluminium vessel of suitable size selected from those given in Table 1. The thermal efficiency shall not be less than 42 percent. The details of the procedure and calculations are laid down in Annex B.

7.2.5 Surface, Floor and Wall Temperature

Surface temperature shall be tested as specified in 22 of IS 5116 : 1985, with the gas turned full on and a vessel containing water according to Table 1 placed over each burner. The gas shall be turned down when the water has boiled to a rate sufficient just to maintain boiling. The grill, if fitted, shall be lit for a period of 30 minutes after equilibrium conditions are reached with the grill pan in position and the full area of the grid covered with a sheet of asbestos of thickness 5 mm.

Table 1 Dimensions of Aluminium Test Vessels
(Clauses 7.2.3 and 7.2.4)

Normal Burner Rating		Outside Diameter of Vessel (Base) (± 5 percent)	Pan Weight With Lid (± 10 percent)	Height to Rim (± 1 percent)	Weight of Water
Over	k cal/h Up to and including	mm	g	mm	kg
—	3 050	190	520	125	2.5
3 050	3 900	230	700	140	4
3 900	4 550	280	1 000	150	6
4 550	5 300	320	1 000	160	9
5 300	6 070	350	2 000	180	14
6 070	7 300	400	5 600	400	40
7 300	8 850	450	6 000	450	60
8 850	11 000	500	7 500	500	80

NOTES

- 1 Distilled water (see IS 1070 : 1992) shall be used for test
- 2 The pans shall be cylindrical with flat bottom
- 3 The finish of the pan bottom from inside shall always be bright

7.3 Specific Requirements for Solid Top Burners. (Hot Plates of Ranges, Boiling Tables, Stockpot Stoves)

7.3.1 Combustion

The combustion requirements shall comply with 21 of IS 5116 : 1985 and 7.2.3. For the test any loose hot-plate rings and plates shall be placed in position, thus conforming to a totally enclosed hot-plate conditions. A pan of the dimensions used for the efficiency test and containing the specified quantity of water according to Table 1 shall be in position during the test. The flue gases shall be sampled at the flue outlet or at outlet end of the primary flue pipe if it is provided by the makers. The sample shall be taken 30 minutes after igniting the burner at the specified rating with hot plate in position.

Where solid tops are an integral part of a range, that is, mounted on the oven, separate tests shall be made with (1) hot plate burner only working and (2) both hot plate and oven working.

Where two or more units are vented into a common flue duct, additional combustion tests of all units shall be made. The procedure of test is laid down in Annex A.

7.3.2 Thermal Efficiency Test

7.3.2.1 Tests on solid type gas stoves or hot plates shall be conducted with flat bottom pan 125 mm deep which covers at least 85 percent of the heated solid working surface but which does not at any point overhang the sides of this surface.

7.3.2.2 Thermal efficiency test from cold start

The method of test shall be as detailed in Annex B. The amount of gas burnt, for calculating heat input to the appliance shall be noted from the starting of the test when hot plate is at room temperature. The thermal efficiency thus tested shall be at least 30 percent.

7.3.2.3 Thermal efficiency test from hot start

The burner shall be allowed to heat up first at the specified normal rating without the pan in position for a period equal to that determined by the test specified in 7.3.2.2. Then the same pan as specified in 7.3.2.1 with water contents shall be placed upon the stove and the gas consumption shall be measured from this point till the temperature of the water in the pan reaches $90 \pm 1^\circ\text{C}$. The rest of the procedure for testing and calculations are as given in Annex B. The gross thermal efficiency thus calculated shall be at least 50 percent.

7.3.3 Surface Floor and Wall Temperature

It shall be tested as specified in 22 of IS 5116 : 1985 with the gas turned full on and a flat bottom vessel arranged centrally on the hot plate. The temperatures at full on rate shall be measured with the water boiling, the water being replenished as necessary.

7.4 Gas Consumption

Each burner assembly under separate ON/OFF control shall give within ± 5 percent of the manufacturer's specified gas consumption in g/h or heat input in kcal/h at 2.942 kN/m^2 (30 gf/cm²) gas inlet pressure when measured as described 19.4 of IS 5116 : 1985.

7.4.1 Multi-burner appliances shall give within $\pm 1\frac{1}{2}$ percent of the declared heat input in kcal/h or gas consumption in g/h at the standard pressure with all the taps turned on

8 INSTRUCTIONS

8.1 The necessary instructions as given in 23 of IS 5116 : 1985 shall be supplied with the appliance.

8.2 If the thermostat markings are not provided on thermostat, temperature chart corresponding to the thermostat settings shall be provided

9 MARKING

9.1 Each appliance shall be legibly and indelibly marked with the following

- a) Manufacturer's name, initials or registered trade-mark,

- b) Type number or name which differs from that of other models for other fuels, that is, coal gas or natural gas,
- c) For use with liquefied petroleum gases at 2 942 kN/m² (30 gf/cm²),
- d) Rating of burners in g/h (l/h);
- e) Any special instructions for the safe operation, and
- f) Country of origin

9.1.1 The information given in 9.1 shall be distinct, permanent and easily accessible when the appliance is installed as it would be in service

10 PACKING

10.1 The requirements given in 24 of IS 5116 : 1985 shall apply.

ANNEX A

(*Clauses 7.2.3 and 7.3.1*)

DETERMINATION OF CARBON MONOXIDE/CARBON DIOXIDE RATIO §

A-1 PROCEDURE

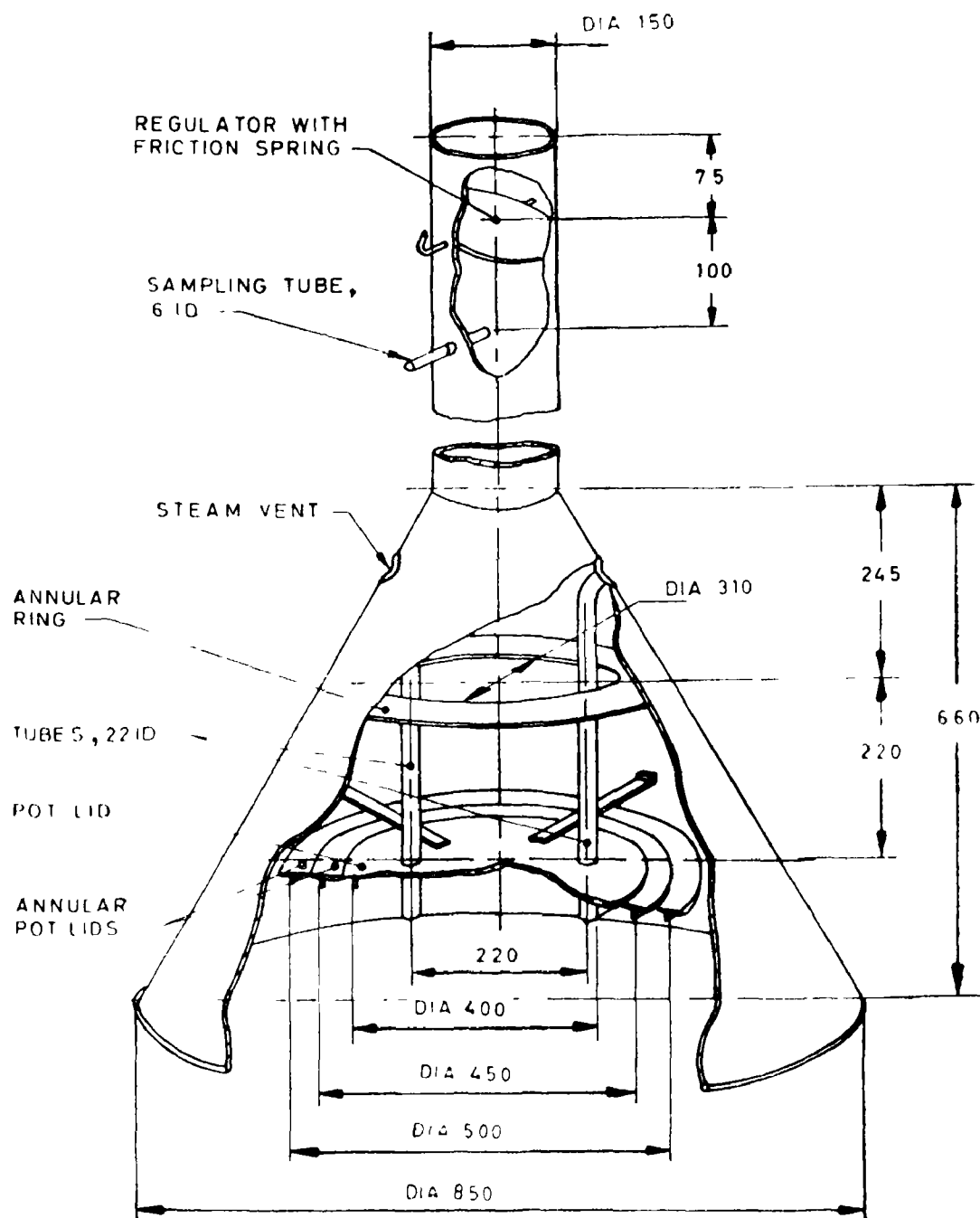
A-1.1 The appliance having open top burner or solid top burner shall be set up in the manner described in 18 of IS 5116 : 1985. An aluminium test vessel of dimensions given in Table 1, according to the burner rating with weight of water given against it, shall be placed over the burner under test. In addition, the sampling hood as shown in Fig. 1 shall be placed over the appliance

A-1.1.1 When using hood, the damper provided shall be set or additional flue pipe added, so that the spillage of the flue gases around the skirt is prevented. With the sampling hood in position over the burner under investigation, Gas specified in B-2(k) at inlet pressure of 2 452 kN/m² (25 gf/cm²) shall be admitted and the burner operated for a few minutes before sampling is commenced. The reason for this being, during

the first few minutes the burner is warming up and the proportion of carbon monoxide may be high. However, this is not dangerous, provided the burner works satisfactorily after heating up

A-1.2 Any of the recognized methods having the prescribed accuracy may be used for gas analysis. For carbon monoxide, it is recommended that CO indicator of prescribed accuracy or the Iodine pentoxide method or catalytic method, for example the Dräger method, the Katz method or Infra-red analysis method may be used. Carbon dioxide may be tested with Orsat apparatus, the Haldane apparatus, or by the Infra-red analysis

A-1.3 Each burner shall be examined with Gas at 2 452 to 3 432 kN/m² (25 to 35 gf/cm²) inlet pressure. It shall also be noted that each burner is tested separately or with all the possible combination of the other burners operating



All dimensions in millimetres.

FIG. 1 HOOD FOR BOILING PAN

ANNEX B

(Clauses 7.2.4, 7.3.2.2 and 7.3.2.3)

THERMAL EFFICIENCY TEST

B-1 PROCEDURE

B-1.1 The test shall be carried out by weighing the gas used. The gas shall be taken from a small bottle containing LPG weighing 1 to 2 kg. The bottle shall be fitted with an 'on/off' valve and shall be connected to a pressure gauge and to the appliance. A second 'on/off' gas valve shall be inserted in the gas ways upstream of the regulator as near as possible to the gas bottle. A typical layout of set up necessary for this test is shown in Fig 2.

B-1.2 The gas shall be passed at 2.942 kN/m^2 (30 gf/cm^2) inlet pressure through the stove for a few minutes to purge the system of air and to establish the gas pressure required. Only one burner of the appliance shall be tested at a time and during the test all gas delivered to the stove shall flow through the jet of the burner being tested. The pan shall be selected and loaded in accordance with the requirements given in Table 1 and placed centrally over the burner being tested. The temperature of the water (t_1) contained shall be noted and recorded as long as it remains constant. The bottle shall be disconnected, weighed, reconnected and valves (1) and (2) opened. The gas control tap shall then be opened and the gas

shall be ignited. The water shall be allowed to warm up to about 80°C when stirring is commenced and continued until the end of the test. The burner shall be put off when the temperature of water reaches $90 \pm 1^\circ\text{C}$. The stirring shall be continued and the maximum temperature (t_2) shall be noted. Next, the valves on the bottle and the gas line shall be closed and the bottle shall be disconnected and reweighed. It is thus possible to estimate the mass of gas used during the period taken for the water to heat up. Thermal efficiency shall be calculated by the following formula

$$e = \frac{100 (G + W) (t_2 - t_1)}{MK}$$

where

e = the thermal efficiency of the burner in percent,

G = quantity of water in the vessel in kg,

W = water equivalent of the vessel complete with stirrer and lid,

t_2 = final temperature of water in $^\circ\text{C}$,

t_1 = initial temperature of water in $^\circ\text{C}$,

M = gas consumption in kg, and

K = calorific value of the gas in kcal/kg.

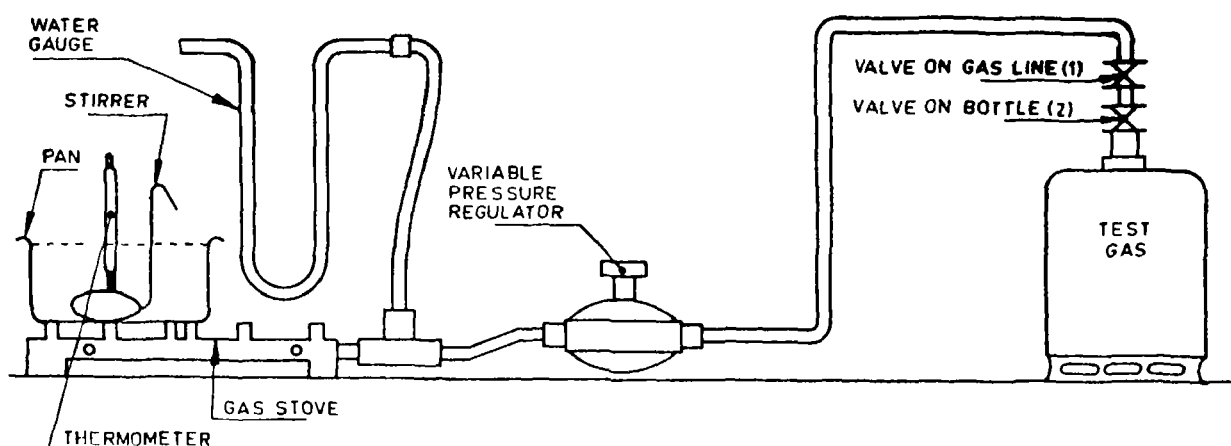


FIG 2 TEST SET-UP FOR THERMAL EFFICIENCY BY WEIGHT

B-2 In performing the thermal efficiency test the following points shall be noted:

- a) The set-up shall be carefully checked for leaks, before and after the test. If a leak is found after the tests, the results should be cancelled and the test repeated.
- b) The room shall be free from draught.
- c) The initial temperature of the room shall be between 25 to 30°C. The water temperature shall be within $\pm 2^\circ\text{C}$ of the actual room temperature.
- d) The net calorific value of gas is used. If this is not determined experimentally, the value may be taken as 10 900 kcal/kg for calculation.
- e) At the start of the test, the burner shall be at room temperature, but for the thermal efficiency test from hot start specified in 7.3.2.3.
- f) The temperature of the water shall be measured by means of a mercury-in-glass thermometer of accuracy of 0.5°C the bulb of which is immersed to half the depth of water in vessel.
- g) Stirring shall be effected by means of a horizontal loop of 3 mm metal rod attached to an upright which passes through a 6 mm hole drilled in lid.
- h) Accuracy of weighing balance used shall be of 0.1 g.
- j) Specific heat of aluminium is 0.214.
- k) For conducting thermal efficiency test, gas from the commercial cylinder (bottle) of LPG, the first two-third of which has been allowed to evaporate (to waste or in vapour withdrawal use), the remaining one-third shall be used for test. The use of last 1 or 2 kg of gas shall be avoided as this may contain heavy ends.

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'. Comments on this Indian Standard may be sent to BIS giving the following reference:

Doc. No. HMD 23 (2137)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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